Macro-quantitative vs. macro-qualitative methods in the social sciences: an example from empirical democratic theory employing new software

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„Macro-Quantitative vs. Macro-Qualitative Methods in the Social Sciences – An Example from Empirical Democratic Theory Employing New Software“

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Abstract: There are some new attempts to bridge the divide between quantitative and qualitative methods in the social sciences (see also BERG-SCHLOSSER & QUENTER 1996). This paper explicitly illustrates and tests some of these methods like regression, cluster, or discriminant analysis, on the one hand, and more recent case- and diversity-oriented methods like QCA, Multi-Value QCA (MVQCA), and Fuzzy-Set QCA (fs/QCA) on the other. This is done by using data to test Lipset's theory of socio-economic "requisites" of democracy on the basis of 18 cases in Europe in the interwar period. In this way, the specific strengths and weaknesses of the respective methods are demonstrated.

1. Introduction

Comparative methods in political science are often applied at the 'macro'-level of political systems, that is, at the total (nation) state level and different aspects observed of the whole system. At this level, the number of cases to be examined is of necessity limited, even if one takes the present number of approximately 200 independent states world wide. Furthermore, the number of useful cases exhibiting a level of commonality on certain questions and availability of sufficient material (for example the OECD states, certain regions of the Third World, etc.) is often even more limited. At the same time, these systems and the interactions which are taken into account, exhibit a high level of complexity. Thus, the classic 'many variables – small N' dilemma of this sub-discipline of Political Science comes into being (see LIJPHART 1971; 1975; COLLIER 1993; AAREBROT & BAKKA 2003).

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There are various ways to deal with this dilemma, among which two dominant camps or schools, a 'macro-quantitative' and a 'macro-qualitative', can be observed. In line with KUHN'S proposition, that scientific paradigms demonstrate not only a theoretical nucleus, but also a social environment which has been formed in a specific manner (see KUHN 1976), the two sides have not spared mutual accusations of applying unscientific procedures, unproven premises, unwarranted conclusions and similar polemics (see LIEBERSON 1991; 1994; 2004; SAVOLAINEN 1994 and, most recently, SEAWRIGHT 2004, RAGIN & RIHOUX 2004). So, the debate is characterised by an astounding amount of selective perceptions, misunderstandings and unjustifiable insinuations. Misunderstood, or misleading formulations and deceptive claims by the protagonists of both sides have contributed to this situation. Attempts at conciliation (for example KANGAS 1994, KING et al. 1994; and, with certain limitations, GOLDTHORPE 1994; RAGIN et al. 1996, and now, more explicitly, BRADY & COLLIER 2004) are rare.

This paper, first, outlines the central tenets and concrete procedures of both positions. It, then, exemplifies these methods by testing an empirical theory of democracy which for a long time had become a major tenet of the "modernization" school in political science (see e.g. DAHL 1989). The data set used for this purpose has been derived from a larger international research project dealing with the conditions of authoritarianism, fascism and democracy in Europe in the inter-war period (see BERG-SCHLOSSER & MITCHELL 2000; 2002). The concluding section, finally, points to some of the consequences of the application of such methods for theory building in the social sciences and some future prospects in this regard.

2. Basic Characteristics and Assumptions of the Opposing Paradigms

2.1 Macro-Quantitative Methods

Macro-quantitative methods and comparative aggregate data analyses have enjoyed increasing popularity since the 'behavioural revolution' in political science (see FALTER 1982). Although this was concentrated mostly at the 'micro' level of politics and research using individual survey data, the preference for statistical analysis (as a result of a large number of cases) and a certain 'scientistic' position also coloured corresponding macro analyses. Inspired by such untiring innovators such as Karl DEUTSCH and Stein ROKKAN, comprehensive data handbooks have been compiled since the 1960's (see for example RUSSET et al. 1964; TAYLOR & JODICE 1982; FLORA et al. 1983, 1987), which together with official and unofficial (primarily economic) statis-

tics formed the starting point for numerous macro-quantitative analyses (NIEDERMAYER & WIDMAIER 2003).

The largest possible number of cases (usually states) with comparable data usually formed the foundation of such studies. However, due to the relatively limited level of basic similarities and in the face of frequently occurring data problems and lack of information, especially in the more 'sensitive' political areas, random sampling, which forms the basis for representative interpretations of the survey results on the 'micro' level, and 'normal distributions' cannot normally be applied. Thus, the 'inferential' statistics which are based on such prerequisites, such as even simple tests used for calculating levels of significance, are, strictly speaking, out of the question. This consequence is often ignored at peril.

Such data can provide useful descriptive averages of certain frequency distributions or serve as a basis for presumably 'universal' explanations based on the actual number of cases, such as in linear (also an often unjustified assumption) regressions. Specific characteristics of individual cases are usually not taken into account using such methods. If such characteristics differ too crassly in the observed distributions, they are often dismissed and neglected as 'outliers'. The fact that the limited number of cases increases the possibility that including one or a few deviating cases can drastically change the end results, is often not respected.

The choice of variables in such analyses should be guided by specific hypotheses and theoretical premises. However, such macro-quantitative approaches and the statistical data involved usually keep the number of independent variables to be examined relatively small (see AMENTA & POULSEN 1994). In addition, there is often a certain economic deterministic bias based on the initial data available, for example the regularly compiled year books from the UN organisations, the World Bank, the OECD, the national statistical offices etc., whose main emphasis lies in this area. As Robert DAHL observed:

> "No doubt one reason why so much attention has been given to the relationship between regime and socio-economic level is simply that reasonably acceptable (if by no means wholly satisfactory) 'hard data' are available from which to construct indicators. This is a perfect example of how the availability of data may bias the emphasis of theory." (DAHL 1971: 206)

In contrast, differentiated socio-cultural or political data in a more specific sense are much more difficult to obtain and seldom collected on a regular basis. 'Misspecifications' on the basis of a limited and prejudiced selection of variables are, therefore, no rare occurrence.

The causal relationships observed are 'probabilistic', that is they are usually based on correlations between a dependent and one or more independent variables. Such correlations can, of course, be 'spurious' (that is they may have occurred due to a third factor which has not been taken into account). The direction of a causal relationship is also not always clear (What came first?

What depends on what?). The assumed causality is, as already stated, 'universal' in nature, that is relating to the average of the observed totality. But, in view of the unrepresentative nature of the selection of cases, 'inferential' generalisations are clearly inadmissible. 'Conjunctural' causalities (which are based on differing combinations of variables) such as described by J. S. MILL (1974/75 [1843]) must also be discarded.

All of these criticisms and others are, of course, obvious and have been known for a long time. They are taken partly into account by more 'robust' statistics (see HAMPEL et al. 1986). However, there still remains a considerable amount of dissatisfaction with regard to the one-sidedness, superficiality and limited theoretical implications of many macro-quantitative investigations. Charles TILLY thus came to the sobering conclusion: "Little of long-term value to the social sciences has emerged from the hundreds of studies conducted during the last few decades that have run statistical analyses including most of the world's nation states." (TILLY 1984: 76)

The rather sweeping defences against such allegations by well-known protagonists of the macro-quantitative school (see JACKMAN 1985; BOLLEN et al. 1993) cannot fully convince either and often deteriorate into misunderstandings or insinuations against the other camp, without critically acknowledging the strengths and weaknesses of each position and constructively translating it into action. If an impression of the present authors' favouring comparative-qualitative methods arises here, this is explained by the dominance to date of quantitative-statistical methods in political science curricula, existing deficits in the comparative field and more recent developments we were involved in and which are not yet known amongst a wider public. However, we are interested in dealing fairly and constructively with the above mentioned problems and in bridging certain gaps between the two camps.

2.2 Macro-Qualitative Methods

Over the last decade, „macro-qualitative" and „diversity-orientated" methods have been more intensively employed and improved using new technological developments (see RAGIN 1987, DRASS & RAGIN 1992, RAGIN; BERG-SCHLOSSER & De MEUR 1996, RAGIN 2000), by developing systematic 'most different' and 'most similar' research designs (see PRZEWORSKI & TEUNE 1970, De MEUR & BERG-SCHLOSSER 1994, 1996), and also by more historically orientated social scientists such as Theda SKOCPOL (1979, 1984) or Dietrich RUESCHEMEYER, Evelyne HUBER STEPHENS and John STEPHENS (1992). Their specific characteristics, which can also be understood as certain compensatory aspects of the quantitative method, will be briefly dealt with in this section.

'Macro-qualitative' is used here to describe the analysis of the presence or not of characteristics specific to the examined cases at the 'macro' level of

political systems. This term should not be confused with qualitative methods at the micro-level (such as participant observations in ethnology) or with qualitative interpretative methods (for example in hermeneutics). Some of the techniques presented here rely on a dichotomisation of the observed variables (yes/no, high/low, 0/1 etc.). In the case of more varied characteristics, certain 'thresholds' must be established for this purpose or a number of 'dummy' variables be formed (as for the conversion of nominal characteristics to variables for certain statistical procedures which require dichotomous variables).

In a number of instances, this entails loss of information. Such losses of information are also present in numerous statistical methods, for example in 'cluster' or 'correspondence' analysis, where multidimensional 'clouds' of cases are projected on a two-dimensional surface, without all the users being fully aware of such limitations. The necessary dichotomisation allows the implementation of new more complex methods on the basis of Boolean algebra, of set theory and elaborated 'similarity' and 'dissimilarity' levels, which represent a certain 'compensation' for the occurring information loss.

In contrast to overall statistical methods, macro-qualitative analyses are more strongly *case* orientated, that is each case which is taken into account has in principle the same value for the analysis. The selection of cases must, therefore, be as hypothesis- and theory-guided as the selection of variables. A minimum amount of homogeneity amongst the cases to be chosen, e.g. historical-regional similarities, must be ensured in order to analyse them meaningfully. Among the more limited number of cases selected in this way, a high level of heterogeneity not only with regard to the dependent variable but also for the possible independent variables is desirable. In this manner, the smaller and less studied countries or strongly 'deviating' cases can often supply interesting information relating to the validity and range of certain hypotheses.

Such a 'case orientation' should not be confused with a 'case-based' in contrast to a 'variable-based' statistical method. Naturally, the cases selected *and* a wide spectrum of possible variables form the basis of the analysis. The range of complexity of the examined cases is, of course, subject to theoretical and practical limitations. However, a high level of familiarity with a large number of cases is a prerequisite for every 'macro-qualitatively' inclined political scientist in order to obtain the necessary sensibility for the often complex and historically determined facts.

In contrast to more 'universal-statistical' attempts at explanation on the one hand and exclusively historical-idiographical (individualising) case studies on the other, macro-qualitative analyses can also expose 'conjunctural' causal relationships, that is different patterns of factor combinations ('variation finding' in the sense of Charles TILLY 1984). The range of these patterns can be ascertained and in certain cases modified by a step by step expansion of the field of examination. A technique such as 'Qualitative Comparative Analysis' (QCA, see below) offers the further possibility of including hypothetically

possible case constellations ('logical remainder cases') in the analysis and of developing at least a hypothetical generalisation over and above the cases taken into account.

3. Application Testing an Empirical Theory of Democracy

Among the large variety of approaches dealing with the more general conditions favouring the emergence of democratic political systems in different parts of the world (see, e.g., DAHL 1971, 1989; DIAMOND 1999; SCHMIDT 2000; BERG-SCHLOSSER 2004) we have selected one concerned with some of the overall socio-economic and "structural" factors. In addition, of course, for any more comprehensive account other factors such as specific historical and cultural conditions, intermediate organisations, institutional arrangements, actor-related aspects, etc. must also be considered (for an application of such a more comprehensive design see also BERG-SCHLOSSER 1998). For our present purposes, however, some illustrations using the selected approach will do.

3.1 Macro-Quantitative Procedures

The most influential relatively early study dealing with the more general socio-economic preconditions of democracy has been S. M. LIPSET'S Political Man (1963), in particular his chapter on "Economic Development and Democracy." There, he (re)stated the general hypothesis that "the more well-to-do a nation, the greater the chances that it will sustain democracy" (p. 31). Indeed, among the "stable European democracies" analyzed by LIPSET were cases like Belgium, the Netherlands, Sweden and Great Britain, which all showed high levels of wealth, industrialization, education, and urbanization. Under his (very broad) category of "unstable democracies and dictatorships" figured countries like Greece, Hungary, Italy, Poland, Portugal, and Spain, with lower levels in this regard. However, he also noted that "Germany is an example of a nation where growing industrialization, urbanization, wealth and education favoured the establishment of a democratic system, but in which a series of adverse historical events prevented democracy from securing legitimacy and thus weakened its ability to withstand crisis" (p. 20). This statement certainly applies to Austria as well, but the kind of "adverse historical events" and their specific roots were not investigated by LIPSET any further. Similarly, the fact that countries like Czechoslovakia, Finland, and France, which also had higher levels of development and democratic institutions and which, as far as internal factors were concerned, survived the economic crisis of the 1930s, were grouped in the same "unstable" category, was not very helpful from an analytical point of view.

In later years, LIPSET'S work was followed by a number of conceptually and statistically more refined studies and drew considerable criticism as well. However, when he later reviewed his original study, he still found its basic tenets confirmed (LIPSET 1994, see also DIAMOND 1992).

The basic data for our analysis are presented in Table 1.

Table 1: Lipset's indicators, raw data

CASEID*	[1]	[2]	[3]	[4]	Outcome
SWE	897	34	99,9	32,3	1
FIN	590	22	99,1	22	1
BEL	1098	60,5	94,4	48,9	1
NET	1008	78,8	99,9	39,3	1
FRA	983	21,2	96,2	34,8	1
UK	1038	74	99,9	49,9	1
CZE	586	69	95,9	37,4	1
AUS	720	33,4	98	33,4	0
GER	795	56,5	98	40,4	0
ITA	517	31,4	72,1	29,6	0
HUN	424	36,3	85	21,6	0
ROM	331	21,9	61,8	12,2	0
POR	320	15,3	38	23,1	0
SPA	367	43	55,6	25,5	0
GRE	390	31,1	59,2	28,1	0
POL	350	37	76,9	11,2	0
EST	468	28,5	95	14	0
IRE	662	25	95	14,5	1

Labels:
[1] Gross National Product / Capita (ca. 1930).
[2] Urbanization (population in towns with 20000 and more inhabitants).
[3] Literacy.
[4] Industrial Labour Force (incl. mining).

Sources: Handbooks used to prepare the tables are Flora et. al. 1983, 1987; League of Nations, Statistical Yearbook, Geneva, various years; Mitchell, Brian R., European Historical Statistics 1750-1975, London: MacMillan, 1891;

* The following acronyms have been used: AUS Austria; BEL Belgium; CZE Czechoslovakia; EST Estonia; FIN Finland; FRA France; GER Germany; GRE Greece; HUN Hungary; IRE Ireland; ITA Italy; NET Netherlands; POL Poland; POR Portugal; ROM Romania; SPA Spain; SWE Sweden; UK United Kingdom.

Statistisches Reichsamt, Statistisches Handbuch der Weltwirtschaft, Berlin, 1936.

For each of the four main dimensions discussed by LIPSET (wealth, urbanization, education, and industrialization), we have selected one major indicator as listed in this table. When we employ, as a first step, some of the common *statistical* ("macro-quantitative") procedures we obtain the following results (see Table 2):

Table 2: Testing Lipset's indicators, statistical procedures

	Procedures:				
				Discriminant analysis	
Variable:	Bivariate correlations	Multiple regression (beta)	Logistic regression R	canonical discriminat-ion function	Wilks' lambda
GNP / cap.	0.739 ***	0.950	0.563	1.256	0.453
Urbanization	0.494 *	0.109	0.163	0.256	0.756
Literacy	0.629 **	0.043	0.455	0.074	0.604
Industrialization	0.473 *	-0.380	0.287	-0.699	0.776
		$R^2 = 0.591$			
"Modernization" (single factor)	0.662 **	0.588 ($R^2 = 0.438$)	0.488		
			(not classified: FI, CZ, BE)	(not classified: CZ, FI, IR, AU, GE)	

levels of significance:
*** = p < 0.001
** = p < 0.01
* = p < 0.05

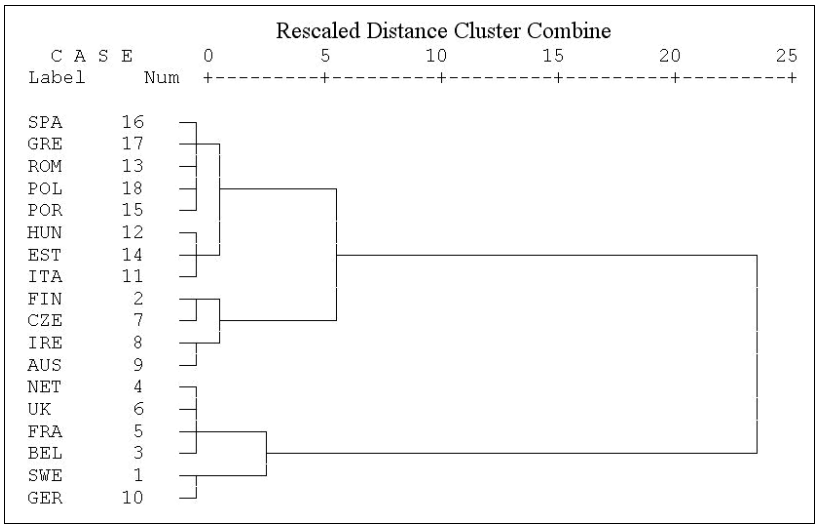
Thus, in line with LIPSET'S arguments, the more general "wealth" of a nation (as measured by GNP per capita) turns out to be the single most highly correlated factor concerning the survival of democracies in the inter-war period, followed by levels of literacy, urbanization, and industrialization. In a *factor analysis*, these variables also load on a single "modernization" dimension. This more comprehensive factor, however, has a somewhat lower correlation than GNP per capita alone. When we apply these variables in a *logistic regression with our dichotomised dependent variable*, again GNP per capita turns out, by far, to be the single most important one. Three cases (FI, CZ, GE) were not classified.

For this reason, we also employed another technique, *discriminant analysis*, to shed some more light on this situation. Discriminant analysis groups cases around the poles of a single axis indicating the respective outcome (here: the survival or breakdown of democracy) and assessing the relative weight of the different variables. Again, GNP/cap. turns out to be the single strongest factor (as expressed by the lowest value for Wilk's lambda), followed by literacy and urbanization and having by far the strongest weight when applied jointly (as

expressed in the canonical discrimination function). Discriminant analysis also lists, however, those cases which could *not* be classified, i.e. 5 out of our 18 including Czechoslovakia, Finland and Ireland among the survival and Austria and Germany among the breakdown cases. For these, at least, we must look for a different explanation!

As a final step among the "macro-quantitative" methods, we employed hierachical *"cluster analysis"* (linkage between groups) to possibly reveal some specific configurations among our cases. The results are given in the dendrogram in Figure 1:

Figure 1: Dendrogram Lipset's Indicators



Here, our clear-cut breakdown cases (ranging from Spain to Italy in the upper half) are grouped together. The second grouping, however, combines the survival cases of Finland, Czechoslovakia and Ireland with the breakdown case of Austria, all of which already had been identified as "problematical" by discriminant analysis. Similarly, the German breakdown case is grouped together with Sweden and, in a further step, with the successful democracies in the Netherlands, the United Kingdom, France and Belgium. Over and above this graphical illustration of some problematic groupings this procedure, which operates as a kind of a "black box", does not tell us *which* variables were responsible for the respective grouping.

All in all, therefore, with these procedures we have identified one major factor (GNP p.c.), followed by literacy, and some problematic cases which cannot be explained so easily. For this reason, more "diversity-oriented" macro-*qualitative* procedures can, at least, meaningfully supplement such an analysis and

point to specific constellations of cases and factors in the sense of specific "conjunctural" causations, but may also help, in the longer run, to develop more refined theories.

3.2 Macro-Qualitative Procedures

3.2.1 Qualitative Comparative Analysis (QCA)

We first employed "Qualitative Comparative Analysis" (QCA) for this purpose (see also RAGIN 1987, RAGIN; BERG-SCHLOSSER & De MEUR 1996, De MEUR / RIHOUX 2002). QCA is a technique based on Boolean algebra, which can reduce variables related to a specific outcome to its minimal "prime implicants" also allowing for possible "conjunctural causations" in this regard. For this purpose each case is described by including all independent variables in the data set and the respective outcome. In a Boolean sense each variable has to be dichotomized, i.e. each variable is either T (True) or F (False). Such thresholds should not be set in any purely mechanical way, for example using the median or similar statistical measures, but should consider the actual distribution of cases avoiding to set the threshold between some closely neighbouring cases (see also the use of the "thresholdssetter" below). In the original version of QCA True conditions are written with uppercase letters, while False conditions are written in lowercase.

In the next step, all cases are placed in a "truth table". In the truth table, cases with the same configuration of variables are grouped together, and each configuration is assigned its QCA characteristic. Cases with the same configuration and the same outcome value (0 or 1) have this outcome value as the QCA characteristic. But if they have identical configurations of independent variables and different outcomes, then the QCA characteristic is set to C (contradiction).

The main step performed in QCA is what Charles RAGIN defined as the minimization rule:

> "If two Boolean expressions differ in only one causal condition yet produce the same outcome, then the causal condition that distinguishes the two expressions can be considered irrelevant and can be removed to create a simpler, combined expression." (RAGIN 1987: 93)

So, if there are two logical configurations in the truth table with the same outcome and they only differ in one variable, then this variable can be considered irrelevant and does not have to be retained. For example, ABC + ABc can be reduced to AB.

The calculations of QCA are performed in two parts. First, all possible minimization steps are carried out. In this part the prime implicants are calculated by executing all possible minimizations by pairwise comparisons of all

possible configurations of factors (McCLUSKEY 1956, QUINE 1952, see also RAGIN 1987). When no more minimizations are possible, these logical expressions are considered to be "prime implicants".

In the second step, these prime implicants are combined into the shortest logical expression possible covering all the cases with the same outcome, where the length of the logical expression is given by the number of variables included in each implicant.

The solutions found by QCA are annotated by the use of Boolean AND and Boolean OR. The expression *O(1) = a*b + b*C* contains two logical expressions (*a*b* and *b*C*) combined by +, which indicates a Boolean OR. This means that all configurations found in the truth table with the outcome 1 are covered by either the prime implicant a*b indicating that *A* as well as *B* are not present or by the prime implicant *b*C* indicating that b is not present but *C* is.

In order to prepare our data set for a Boolean type of analysis, we had to dichotomize each variable according to certain thresholds (of "high" or "low") (see Table 3).

Table 3: Lipset's Indicators, Boolean Version

CASEID	[1]	[2]	[3]	[4]	Outcome
SWE	1	0	1	1	1
FIN	0	0	1	0	1
BEL	1	1	1	1	1
NET	1	1	1	1	1
FRA	1	0	1	1	1
UK	1	1	1	1	1
CZE	0	1	1	1	1
AUS	1	0	1	1	0
GER	1	1	1	1	0
ITA	0	0	0	0	0
HUN	0	0	1	0	0
ROM	0	0	0	0	0
POR	0	0	0	0	0
SPA	0	0	0	0	0
GRE	0	0	0	0	0
POL	0	0	1	0	0
EST	0	0	1	0	0
IRE	1	0	1	0	1

Labels and thresholds:

[1] Gross National Product / Capita (ca. 1930); 0 if below 600$; 1 if above.
[2] Urbanization (population in towns with 20000 and more inhabitants); 0 if below 50%; 1 if above.
[3] Literacy; 0 if below 75%; 1 if above.
[4] Industrial Labour Force (incl. mining); 0 if below 30% of active population; 1 if above.

The particular thresholds chosen, which seem to be in line with Lipset's basic arguments and which allow a meaningful dichotomisation of the data, are indicated at the bottom of the table. The presence (1) or absence (0) of each factor is listed here for all of our cases, along with the respective outcome, that is, the survival (1) or breakdown (0) of democracy. In the resulting reduced formulas the presence of a factor is expressed by upper case and the absence by lower case letters. In Table 4 the truth table for the data set is presented.

Table 4: Lipset's Indicators, Truth Table of the Boolean Configurations

CASEID	[1]	[2]	[3]	[4]	Outcome
SWE,FRA,AUS	1	0	1	1	C
FIN,HUN,POL,EST	0	0	1	0	C
BEL,NET,UK,GER	1	1	1	1	C
CZE	0	1	1	1	1
ITA,ROM,POR,SPA,GRE	0	0	0	0	0
IRE	1	0	1	0	1

Labels and thresholds: See Table 3.

In this way, it already becomes apparent that Lipset's (positive) conditions are fulfilled in a "pure" sense in only three of our eighteen cases (Belgium, Great Britain, and the Netherlands). However, this is contradictory to the German case, which also satisfies these conditions. In a negative sense, Lipset's hypothesis is confirmed in the cases of Greece, Hungary, Italy, Poland, Portugal, Romania, and Spain. Czechoslovakia is a (democratic) case which ranks high on all indicators, except for wealth which is somewhat below the threshold. Ireland, another "survival" case, has relatively low values of urbanization and industrialization. The cases of Finland (democratic) and Estonia (breakdown) have identical values for all indicators and rank high only on literacy. Similarly, France and Sweden (democratic) and Austria (breakdown) show a contradictory constellation being relatively developed, except for urbanization.

This descriptive pattern is reproduced by QCA giving the term g · u · l · i for the clear-cut breakdown cases.

The prime implicants for the few non-contradictory democratic survival cases are:

$$G \cdot u \cdot L \cdot i \text{ (IRE)} + g \cdot U \cdot L \cdot I \text{ (CZE)}$$

Since QCA is a procedure which is based on all possible configurations of (independent) variables and the subsequent minimization leading to the shortest expressions of non-contradictory conditions, it happens very often that some logically possible combinations of factors are not represented among the actual cases selected. For example, in a data set with six variables and twenty cases $2^6 = 64$ configurations are possible but only a maximum of twenty (if no identical configurations exist among them) are covered.

Nevertheless, QCA can include these non-existing logical configurations (so-called "logical remainders") in the analysis. This can lead to even simpler prime implicants, and shorter QCA solutions for the outcomes. The software also may list all "simplifying assumptions" employed for this further reduction.

If we apply this possibility for our data set, QCA produces the term *l*, i.e. a low level of literacy, as the single major condition for the breakdowns. If "logical remainders" are included for the survivor cases we obtain the (somewhat) reduced formula:

G*i (IRE) + g*(U+I) (CZE), i.e. a high GNP and a low level of industrialization for Ireland and low GNP combined with either a high level of urbanization or of industrialization for Czechoslovakia.

All in all, therefore, LIPSET'S sweeping "modernization" hypothesis is reduced to a lack of literacy for the majority of breakdown cases and some specific constellations for the (few) clear-cut survivals. Furthermore, there are 9 (i.e. half of our universe of cases) instances which remain contradictory and cannot be explained in this way.

3.2.2 Multi-Value Qualitative Comparative Analysis – MVQCA

It can be argued, that some part of this result is due to the relatively crude dichotomization procedure and the particular thresholds chosen which always entails a certain loss of information. We, therefore, employed another, still more recent procedure, *MVQCA (Multi-Value QCA)* – based on work by electrical engineers at Berkeley (BRAYTON / KHATRI 1999) – which is based on the same principles as QCA but employs a somewhat different (and faster, which is important for greater numbers of variables) algorithm which also allows to use more differentiated multi-value variables (see CRONQVIST 2003).

The data no longer have to be dichotomized, and more differentiated scales can be used. MVQCA works in the same way as QCA but two important changes do apply: First, the QCA notation with lowercase and uppercase letters

is no longer useable, as more than two values are possible. Instead, set notation is used: A{0} indicates a value of 0 for A, B{1} indicates a value of 1 for B, etc.. Second, the minimization rule has to be changed. For multi-value reduction the minimization rule can be written as:

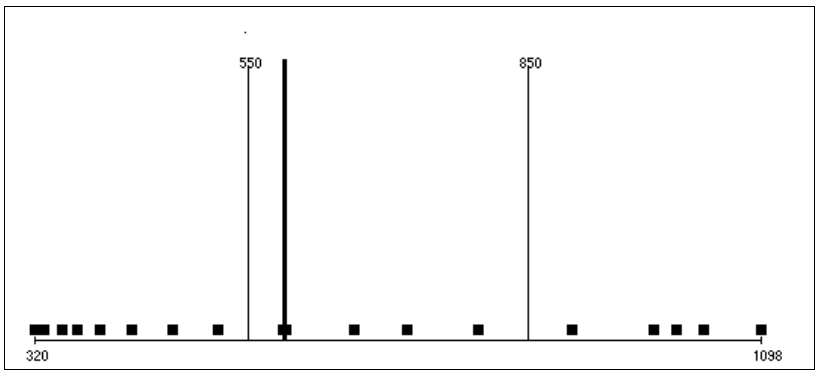
> "If all *n* multi-value expressions $(c_0\Phi,\ldots,c_{n-1}\Phi)$ differ only in the causal condition *C* while all *n* possible values of *c* produce the same outcome, then the causal condition *C* that distinguishes these *n* expressions can be considered irrelevant and can be removed to create a simpler, combined expression Φ." (CRONQVIST 2003: 9)

If *A* has three possible values {0,1,2}, then *A* can only be considered irrelevant for an outcome of Φ if all three values of A combined with Φ have this outcome.

The use of multi-value variables thus solves to some extent the problem of information loss due to dichotomization. The sub-division of variables, according to meaningful thresholds, should, however, remain limited in order not to "individualize" all cases making any further minimization (and thus the extraction of some common factors and some theoretical generalizations) impossible. To facilitate this sub-division of variables, a "thresholdssetter" has been included in the new software (TOSMANA, CRONQVIST 2005). It consists of a graphical interface to identify the most suitable thresholds. In this way, thresholds separating closely related data points can be avoided and a more meaningful grouping of cases distinguishing, for example, low, medium and high levels, becomes possible.

To exemplify the use of MVQCA, we divided the GNP variable into three categories (G{0}=below $550, G{1}= $550 to $850, G{2}= above $850) as shown in Figure 2 and ran the same procedures together with the other (still dichotomized) variables.

Figure 2: Using two thresholds for the GNP Variable



This resulted in the truth table of Table 5.

Table 5: Lipset's Indicators, Multi-Value Truth-Table

CASEID	[1]	[2]	[3]	[4]	Outcome
SWE,FRA	2	0	1	1	1
FIN,IRE	1	0	1	0	1
BEL,NET,UK	2	1	1	1	1
CZE,GER	1	1	1	1	C
AUS	1	0	1	1	0
ITA,ROM,POR,SPA,GRE	0	0	0	0	0
HUN,POL,EST	0	0	1	0	0

Labels and thresholds:

[1] Gross National Product / Capita (ca. 1930); 0 if below 550$; 1 if above 550$ but below 850$; 2 if above 850$.
[2] Urbanization (population in towns with 20000 and more inhabitants); 0 if below 50%; 1 if above.
[3] Literacy; 0 if below 75%; 1 if above.
[4] Industrial Labour Force (incl. mining); 0 if below 30% of active population; 1 if above.

Now, a more differentiated picture emerges. First of all, the number of contradictory constellations is reduced to only two cases (Czechoslovakia and Germany). The positive outcomes are expressed by the formula:

$$G\{2\}\cdot L\{1\}\cdot I\{1\}\ (Swe,Fra,Bel,Net,UK) + G\{1\}\cdot U\{0\}\cdot L\{1\}\cdot I\{0\}\ (Fin,Ire)$$

If we include "logical remainders", this is reduced to:

$$G\{2\} + G\{1\}\cdot I\{0\}$$

This means that either a high level of income (Lipset's "classic" cases) or a medium income with low industrialization are conducive to the survival of democracy. The latter result points to a different theoretical explanation, for example VANHANEN's (1984) emphasis on family farms and the rural middle class in still largely agricultural countries.

Conversely, the breakdowns are represented by the formula:

$$G\{0\}\cdot U\{0\}\cdot I\{0\}\ (Ita,Rom,Por,Spa,Gre,Hun,Est) + G1\cdot U0\cdot L1\cdot I1\ (Aus)$$

When remainders are included, this leads to:

$$G\{0\} + G\{1\}\cdot U\{0\}\cdot I\{1\}\ (Aus)$$

Thus, again, the "classic" low income countries are separated from the more mixed and controversial case of Austria. This can serve as a hint for specialists for this case and period to further investigate and such conditions (see also GERLICH / CAMPBELL 2000).

3.2.3 Fuzzy-Sets

Another recent software ("fs/QCA"), developed by Charles RAGIN and Kriss DRASS, is based on *"fuzzy sets"* (RAGIN 2000). Here, too, the original dichotomization of variables for "crisp" sets is relaxed to allow for differentiated values. This is done working with re-calibrated scales for each variable. Thus, for example, the original values of GNP per capita are transformed into a five-fold ordinal scale ranging from "very low" and "low" over a "crossover point" in the middle to "high" and "very high". Arithmetically, this can be represented by values ranging from 0.17 and 0.33, a middle value of 0.5 to 0.67 and 0.83. For some variables, where this makes sense, an absolute value of 0 and of (practically) 1 (i.e. 100%) can be included to form a seven-point scale.

This re-calibration, in addition to providing more information, is justified for variables which, even though the original data may be metric, create an impression of a "false precision". This is true, for example, for the still most commonly used GNP per capita indicator. In addition to the fact that this variable usually does not reflect, in view of the varying international exchange rates, actual purchasing power (or has to be adjusted for this purpose as in the "Human Development Index" HDI, see UNDP 1990 ff.) and does not include non-monetary or non-registered transactions as in the "informal" sector or concerning subsistence production or household work, it also measures differences in income, e.g. between $500.- and $1.000.- per capita or between $14.500.- and $15.000.- per capita, in a purely metric way, even though the difference in living standards is very considerable in the first instance and relatively marginal in the second. For many social science purposes, therefore, it makes more sense to speak of "low", "middle", and "high" incomes in a somewhat vaguer ("fuzzy") sense than to insist on metric numbers.

Based on such insights, "fuzzy set analysis" allows for different levels on such scales to find out whether under somewhat relaxed ("probabilistic") circumstances a variable can be considered to be a "necessary" and/or "sufficient" condition for any particular outcome. Necessary conditions are those (like "constants" in any particular causal pattern) which *must* be present for any particular outcome to occur. Sufficient conditions concern those factors which, combined, produce the specific outcome.

In our example, concerning the original Lipset hypothesis, "modernization" or one of its components may be such a necessary, even though not always sufficient, condition for democratization. In this more relaxed form, we can test this hypothesis with the "fs/QCA" software. For this purpose, we have trans-

formed and "re-calibrated" the original data for our 18 European interwar cases in the following way (see Table 6).

Table 6: Lipset's Indicators, Fuzzy Values

Case	[1]	[2]	[3]	[4]	Outcome
NET	0.83	0.83	1.00	0.83	1.00
BEL	0.83	0.67	1.00	0.83	1.00
SWE	0.83	0.33	1.00	0.67	1.00
FRA	0.83	0.17	1.00	0.67	1.00
FIN	0.67	0.17	1.00	0.33	1.00
IRL	0.67	0.17	1.00	0.17	1.00
UK	0.83	0.83	1.00	0.83	1.00
CZE	0.67	0.83	1.00	0.67	1.00
EST	0.33	0.33	1.00	0.17	0.00
GER	0.67	0.67	1.00	0.83	0.00
AUS	0.67	0.33	1.00	0.67	0.00
POL	0.17	0.33	0.83	0.17	0.00
SPA	0.17	0.33	0.67	0.33	0.00
POR	0.17	0.17	0.33	0.33	0.00
HUN	0.33	0.33	0.83	0.33	0.00
ITA	0.33	0.33	0.83	0.33	0.00
GRE	0.17	0.33	0.67	0.33	0.00
ROM	0.17	0.17	0.67	0.17	0.00

Labels:
[1] Gross National Product / Capita (ca. 1930).
[2] Urbanization (population in towns with 20000 and more inhabitants.
[3] Literacy.
[4] Industrial Labour Force (incl. mining).

A first run, with the default values of a probability of 80% and a significance level of $p<0.05$, did not identify any necessary or sufficient conditions neither concerning Lipset's original four indicators nor the combined "modernization" factors. Only when we relaxed the probability to 0.60 then a high level of literacy was identified as a necessary condition for the survival of democracy. When we also modified the outcome variable taking account of the situation in 1929, i.e. before the world economic crisis, when some of the major breakdowns (as in Austria or Germany) had not yet occurred and allowing for a "low" level of democracy in countries like Hungary or Romania where

some kind of democratic "façade" was maintained in this period, again the default values did not produce any necessary or sufficient conditions. Now, however, at a level of 0.70 literacy was again identified as the single necessary variable.

This finding thus coincides with and supplements to some extent the QCA and MVQCA results where for the clear-cut breakdown cases (including "logical remainders") a low level of literacy had been identified as the single most important factor. In none of these procedures, however, any "sufficient" conditions could be identified indicating the limited nature of modernization theory.

4. Conclusions

On the whole, therefore, these socioeconomic indicators, if applied very broadly in a purely statistical sense, have a limited explanatory power. They discriminate not sufficiently between the actual instances of democratic survival and breakdown in the universe of cases analyzed. The industrialization variable, for example, adds very little over and above the differentiations already provided by the other three indicators (serving only to distinguish Austria from Sweden among the mixed cases and to avoid one contradiction). Accordingly, for the purposes of a genuinely qualitative and categorical (and not merely statistical) analysis more discriminating variables as employed in our MVQCA example are called for. These variables also resolved some of the remaining contradictions.

In a substantive sense, the macro-qualitative methods highlighted literacy as the major modernization variable in contrast to GNP p.c. which came out as the strongest single factor in the statistical analysis. In addition to producing a more differentiated result, the macro-qualitative finding also seems more plausible in light of other studies emphasising literacy as the single most important socio-economic factor of democratisation processes (see, e.g. HADENIUS 1992) and the fact that literacy rather than mere wealth (which, furthermore, may be very unevenly distributed!) has a more direct bearing on a well-informed and politically equal democratic citizenry.

As far as the strengths and weaknesses of our methodological tools are concerned, these also could be exemplified quite clearly. The "averaging out" of most statistical procedures certainly is a major weakness when we deal, as almost by necessity in comparative politics and historical sociology at the macro level, with a limited and small number of cases. Correlations and regressions then may be quite misleading when influenced by some strong outliers (another example is also discussed in BERG-SCHLOSSER & QUENTER 1996). Conversely, QCA and similar tools are helpful for a more diversified "variation-finding" in TILLY's sense. At the extreme, however, they may lead to "individualizing" results describing the historical uniqueness of each case.

Between the extremes of over-generalizing and "universalizing" macro-quantitative approaches, on the one hand, and purely individualizing case-oriented approaches, on the other, a meaningful "medium-range" social science can be built which, at the same time, has a higher explanatory power and greater social and political relevance.

References

Aarebrot, Frank H., & Bakka, Pal H. (2003[4]). Die Vergleichende Methode in der Politikwissenschaft. In Dirk Berg-Schlosser & Ferdinand Müller-Rommel (Eds.) *Vergleichende Politikwissenschaft. Ein einführendes Studienhandbuch* (pp. 57-76). Opladen: Leske+Budrich.

Amenta, Edwin & Poulsen, Jane D. (1994). Where to Begin. A Survey of Five Approaches to Selecting Independent Variables for Qualitative Comparative Analysis. *Sociological Methods and Research,* 23, 22-53.

Berg-Schlosser, Dirk & Quenter, Sven (1996). Macro-Quantitative vs. Macro-Qualitative Methods in Political Science – Advantages and Disadvantages of Comparative Procedures using the Welfare-State Theory as an Example. *Historical Social Research,* 21, 3-25.

Berg-Schlosser, Dirk (1998). Conditions of Authoritarianism, Fascism and Democracy in Inter-War Europe: A Cross-Sectional and Longitudinal Analysis. *International Journal of Comparative Sociology,* 39 (4), 335-377.

Berg-Schlosser, Dirk & Mitchell, Jeremy (2000) (Eds.). *Conditions of Democracy in Europe, 1919-39. Systematic Case Studies*. London: MacMillan.

Berg-Schlosser, Dirk & Mitchell, Jeremy (2002) (Eds.). *Authoritarianism and Democracy in Europe 1919-1939. Comparative Analyses*. London: Palgrave.

Berg-Schlosser, Dirk (2004) (Ed.). *Democratization in Comparative Perspective – The State of the Art*, IPSA series, Wiesbaden: VS Verlag.

Bollen, Kenneth A.; Entwisle, Barbara & Alderson, Arthur S. (1993). Macro-comparative Research Methods. *Annual Review of Sociology,* 19, 321-351.

Brady, Henry E. & Collier, David (2004) (Eds.). *Rethinking Social Inquiry: Diverse Tools, Shared Standards*, Lanham: Rowman and Littlefield Publishers.

Brayton, Robert K. & Khatri, Sunil P. (1999). *Multi-Value Logic Synthesis*. Paper. University of Berkeley, CA. (Available from http://www-cad.eecs.Berkeley.edu/Respep /Research/mvsis/doc/ mvsis_main.pdf [cited 2005-07-12]).

Collier, David (1993). The Comparative Method. In Ada W. Finifter (Ed.) *Political Science: the State of the Discipline II* (pp. 105-119). Washington/D.C.: American Political Science Association.

Cronqvist, Lasse (2003). *Using Multi-Value Logic Synthesis in Social Science.* Paper prepared for the 2nd General Conference of the European Consortium for Political Research (ECPR), Marburg, September 2003.

Cronqvist, Lasse (2005). *TOSMANA – Tool for Small-N Analysis.* Version 1.202. Marburg: University of Marburg. (Available from http://www.tosmana.net [cited 2005-07-12]).
Dahl, Robert A. (1971). *Polyarchy: Participation and Democracy*. New Haven CT: Yale University Press.
Dahl, Robert A. (1989). *Democracy and its Critics*. New Haven CT: Yale University Press.
De Meur, Gisèle & Berg-Schlosser, Dirk (1994). Comparing Political Systems – Establishing Similarities and Dissimilarities. *European Journal for Political Research,* 26, 193-219.
De Meur, Gisèle & Berg-Schlosser, Dirk (1996). Conditions of Authoritarianism, Fascism and Democracy in Inter-war Europe: Systematic Matching and Contrasting of Cases for 'Small N' Analysis. *Comparative Political Studies,* 29, 423-468.
De Meur, Gisèle & Rihoux, Benoit (2002). *L'analyse quali-quantitative comparée (AQQC/QCA): Approche, techniques et applications en sciences humaines*. Louvain-La-Neuve: Academia Bruylant.
Diamond, Larry (1992). Economic Development and Democracy reconsidered. *American Behavioral Scientist,* 35, 450-499.
Diamond, Larry (1999). *Developing Democracy: Toward Consolidation.* Baltimore MD: John Hopkins University Press.
Drass, Kris & Ragin, Charles C. (1992). *Qualitative Comparative Analysis 3.0.* Evanston/Ill. (Available from http://www.u.arizona.edu/~cragin/software.htm [cited 2005-07-12]).
Falter, Jürgen W. (1982). *Der „Positivismusstreit" in der amerikanischen Politikwissenschaft.* Opladen: Westdeutscher Verlag.
Flora, Peter et al. (1983). *State, Economy, and Society in Western Europe 1815-1975. A Data Handbook. Volume I: The Growth of Mass Democracies and Welfare States*. Frankfurt/M.: Duncker & Humblot.
Flora, Peter; Kraus, Franz & Pfenning, Winfried (1987). *State, Economy, and Society in Western Europe 1815-1975. A Data Handbook. Volume II: The Growth of Industrial Societies and Capitalist Economies.* Frankfurt/M: Duncker & Humblot.
Gerlich, Peter & Campbell, David (2000). Austria: From Compromise to Authoritarianism, In Dirk Berg-Schlosser & Jeremy Mitchell (Eds.) *Conditions of Democracy in Europe, 1919-39. Systematic Case-Studies* (pp. 40-58). London: MacMillan.
Goldthorpe, John H. (1994). *Current Issues in Comparative Macrosociology*. Department of Sociology, University of Oslo, Rapport Nr. 6/1994.
Hadenius, Axel (1992). *Democracy and Development*. Cambridge: Cambridge University Press.
Hampel, Frank R. et al. (1986). *Robust Statistics. The Approach Based on Influence Functions*. New York: Wiley & Sons.
Jackman, Robert W. (1985). Cross-national Statistical Research and the Study of Comparative Politics. *American Journal of Political Science,* 29, 161-182.

Kangas, Olli (1994). The politics of social security: on regressions, qualitative comparisons, and cluster analysis. In Thomas Janoski & Alexander M. Hicks (Eds.) *The Comparative Political Economy of the Welfare* (pp. 346-364). Cambridge: Cambridge University Press, 346-364.

King, Gary: Keohane, Robert O. Keohane & Verba, Sidney (1994). *Designing Social Inquiry: Scientific Inference in Qualitative Research.* Princeton: Princeton University Press.

Kuhn, Thomas S. (1976). *Die Struktur wissenschaftlicher Revolutionen.* Frankfurt/M.: Suhrkamp Verlag.

Lieberson, Stanley (1991). Small N's and Big Conclusions: an Examination of the Reasoning Based on a Small Number of Cases. *Social Forces*, 70, 307-320.

Lieberson, Stanley (1994). More on the Uneasy Case for Using Mill-Type Methods in Small-N Comparative Studies. *Social Forces,* 72, 1225-1237.

Lieberson, Stanley (2004). Comments on the Use and Utility of QCA. *Qualitative Methods,* 2 (2), 13-14.

Lijphart, Arend (1971). Comparative Politics and the Comparative Method. *American Political Science Review,* 65, 682-693.

Lijphart, Arend (1975). The Comparable Cases Strategy in Comparative Research. *Comparative Political Studies,* 8, 158-176.

Lipset, Seymour M. (1963). *Political Man. The social bases of Politics.* New York.

Lipset, Seymour M. (1994). The social requisites of democracy revisited. *American Sociological Review* 59: 1-22.

McCluskey, Edward J. (1956). Minimization of Boolean Functions. *Bell Systems Technical Journal,* 35, 1417-1444.

Mill, John S. (1974/75). *A System of Logic.* Collected Works of J. S. Mill (vol. 7/8). London (first 1843).

Niedermayer, Oskar & Widmaier, Ulrich (2003). Quantitativ vergleichende Methoden. In Dirk Berg-Schlosser & Ferdinand Müller-Rommel (Eds.) *Vergleichende Politikwissenschaft* (pp. 77-101). Opladen: Leske+Budrich.

Przeworski, Adam & Teune, Henry (1970). *The Logic of Comparative Social Inquiry*. New York: Wiley.

Quine, W. V. (1952). The Problem of Simplifying Truth Functions. *American Mathematic Monthly,* 59, 521-531.

Ragin, Charles C.; Berg-Schlosser, Dirk & De Meur, Gisèle (1996). Political Methodology: Qualitative Methods in Macropolitical Inquiry. In Robert E. Goodin & Hans-Dieter Klingemann (Eds.) *A New Handbook of Political Science* (pp. 749-768). Oxford: Oxford University Press.

Ragin, Charles C. (1987). *The Comparative Method. Moving Beyond Qualitative and Quantitative Strategies*. Berkeley CA: University of California Press.

Ragin, Charles C. (2000). *Fuzzy set social science*, Chicago: The University of Chicago Press.

Ragin, Charles C. & Rihoux, Benoît (2004). Qualitative Comparative Analysis (QCA): State of the Art and Prospects. *Qualitative Methods. Newsletter of the American Political Science Assiociation Organized Section on Qualitative Methods,* Fall 2004, 3-13.

Rueschemeyer, Dietrich; Stephens, Evelyne Huber & Stephens, John D. (1992). *Capitalist Development and Democracy.* Chicago: University of Chicago Press.

Russet, Bruce N. et al. (1964). *World Handbook of Political and Social Indicators*. New Haven: Yale University Press.

Savolainen, Jukka (1994). The Rationality of Drawing Big Conclusions Based on Small Smaples In Defense of Mill's Methods. *Social Forces,* 72, 1217-1224.

Schmidt, Manfred (2000[3]). *Demokratietheorien*. Opladen: Leske + Budrich.

Seawright, Jason (2004). Qualitative Comparative Analysis vis-a-vis Regression. *Qualitative Methods,* 2 (2), 14-17.

Skocpol, Theda (1979). *States and Social Revolutions. A Comparative Analysis of France, Russia, and China*. Cambridge: Cambridge University Press.

Skocpol, Theda (1984) (Ed.). *Vision and Method in Historical Sociology*. Cambridge: Cambridge University Press.

Taylor, Charles L. & Jodice, David A. (1982[3]) (Eds.) *World Handbook of Political and Social Indicators.* New Haven: Yale University Press.

Tilly, Charles (1984). *Big Structures, Large Processes, Huge Comparisons.* New York: Russell Sage Foundation.

UNDP (1990 ff.) *Human Development Report*. New York.

Vanhanen, Tatu (1984). *The Emergence of Democracy. A Comparative Study of 119 States. 1850-1979.* Helsinki: The Finnish Society of Sciences and Letters.